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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Applicant(s):	Kyeong Jin Kim	
Filed:	06/20/2003	
Art Unit:	2611	
Examiner:	Eva Y. Zheng Puente	
Title:	APPARATUS AND ASSOCIATED METHOD FOR DETECTING DATA COMMUNICATED TO A RECEIVING STATION IN A MULTIPLE-CHANNEL COMMUNICATION SYSTEM	

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APPEAL BRIEF UNDER 37 CFR § 41.37

This Appeal Brief is filed pursuant to the "Notice of Appeal to the Board of Patent Appeals and Interferences," filed December 2, 2008.

1. ***Real Party in Interest.***

The real party in interest in this appeal is Nokia Corporation, the assignee of the above-referenced patent application.

2. ***Related Appeals and Interferences.***

There are no related appeals and/or interferences involving this application or its subject matter.

3. ***Status of Claims.***

All of the pending claims, namely Claims 1, 3, 4, 6, 7, 9-17 and 19-24, stand rejected and are the subject of the present appeal.

4. ***Status of Amendments.***

There are no unentered amendments in this application.

5. ***Summary of Claimed Subject Matter.***

The claimed invention will now be summarized with references to passages of the specification and drawings. It should be understood, however, that the references are provided solely for explanatory purposes, and should not otherwise in and of themselves be taken to limit the scope of the claimed invention.

Relative to FIG. 1, for example, independent Claim 1 recites an apparatus **50** including a selector **52** and a decoder **54**. Pat. Appl., page 11, lines 5-10. The selector is configured to select metric calculator values for respective ones of a plurality of channels in a Multiple-Input, Multiple-Output communication system **10** in which transmit data is communicated to a receiving station upon the plurality of channels and received as receive data thereat. *Id.* at page 9, lines 26-30; and page 11, lines 14-21. As recited, the metric calculator values selected for at least two of the channels differ from one another. *Id.* at page 10, lines 23-28 (explaining that different channels exhibit different communication conditions); and page 11, lines 17-21 (explaining that the selector is responsive to the channel conditions to select values of M for different decoder sub-elements).

The decoder is configured to separately decode values of the receive data received upon separate ones of the channels. Pat. Appl., page 11, lines 10-14. For the values of the receive data received upon each of the channels, the decoder is configured to perform a path length estimation for the respective channel, including being configured to calculate a path length for each of a number of possible paths upon which to estimate a minimum path length. *Id.* at page 11, lines 10-14 and 25-28. In this regard, the number of possible paths is selected based on the metric calculator value selected for the respective channel. *Id.* at page 11, line 30 – page 12, line 4.

Independent Claim 15 recites a method including selecting metric calculator values for respective ones of a plurality of channels in a Multiple-Input, Multiple-Output communication system **10** in which transmit data is communicated to a receiving station upon the plurality of

channels and received as receive data thereat. *Id.* at page 9, lines 26-30; and page 11, lines 14-21. As recited, the metric calculator values selected for at least two of the channels differ from one another. *Id.* at page 10, lines 23-28 (explaining that different channels exhibit different communication conditions); and page 11, lines 17-21 (explaining that the selector is responsive to the channel conditions to select values of M for different decoder sub-elements).

As also recited, the method includes separately decoding values of the receive data received upon separate ones of the channels. Pat. Appl., page 11, lines 10-14. For the values of the receive data received upon each of the channels, decoding the values of the receive data includes performing a path length estimation for the respective channel, including calculating a path length for each of a number of possible paths upon which to estimate a minimum path length. *Id.* at page 11, lines 10-14 and 25-28. In this regard, the number of possible paths is selected based on the metric calculator value selected for the respective channel. *Id.* at page 11, line 30 – page 12, line 4.

Independent Claim 21 recites an apparatus **50** including circuitry configured to select metric calculator values for respective ones of a plurality of channels in a Multiple-Input, Multiple-Output communication system **10** in which transmit data is communicated to a receiving station upon the plurality of channels and received as receive data thereat. *Id.* at page 9, lines 26-30; and page 11, lines 14-21. As recited, the metric calculator values selected for at least two of the channels differ from one another. *Id.* at page 10, lines 23-28 (explaining that different channels exhibit different communication conditions); and page 11, lines 17-21 (explaining that the selector is responsive to the channel conditions to select values of M for different decoder sub-elements).

As also recited, the circuitry is also configured to separately decode values of the receive data received upon separate ones of the channels. Pat. Appl., page 11, lines 10-14. For the values of the receive data received upon each of the channels, the circuitry is configured to perform a path length estimation for the respective channel, including being configured to calculate a path length for each of a number of possible paths upon which to estimate a minimum path length. *Id.* at page 11, lines 10-14 and 25-28. In this regard, the number of possible paths is

selected based on the metric calculator value selected for the respective channel. *Id.* at page 11, line 30 – page 12, line 4.

6. ***Grounds of Rejection to be Reviewed on Appeal.***

Independent Claims 1, 15 and 21 stand objected to for including an informality. Claims 1, 3, 4, 6, 9-17, 19-22 and 24 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Application Publication No. 2004/0120411 to Walton et al., in view of U.S. Patent No. 6,385,753 to Hatakeyama. And the remaining claims, namely Claims 7 and 23, stand rejected as being unpatentable over Walton in view of Hatakeyama, and further in view of the publication, Kyeong Jin Kim & Ronald A. Iltis, *Joint Detection and Channel Estimation Algorithms for QS-CDMA Signals over Time-Varying Channels* (May 2002) (hereinafter "*Kim/Iltis*"). All of the aforementioned claim objections and rejections are the subject of this appeal.

7. ***Argument.***

As indicated above, independent Claims 1, 15 and 21 stand objected to for including an informality; and Claims 1, 3, 4, 6, 7, 9-17 and 19-24 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Application Publication No. 2004/0120411 to Walton et al., in view of U.S. Patent No. 6,385,753 to Hatakeyama, alone or further in view of *Kim/Iltis*. As explained below, Appellant respectfully submits that Claims 1, 15 and 21 are in fact proper, and that the claimed invention is patentably distinct from Walton, Hatakeyama and *Kim/Iltis*, taken individually or in any proper combination. In view of the remarks presented herein, Appellant respectfully requests reconsideration of the application and reversal of the rejection of all of the pending claims thereof.

A. Claims 1, 15 and 23 are Proper

Independent Claim 1, line 23 (and similarly Claims 15 and 21) stands objected to for reciting "value" after "calculator," the Examiner asserting that the recitation should instead be "values." Appellant respectfully disagrees, however, and notes that claims should in fact recite

"value." In this regard, as recited, values are selected for respective ones of a plurality of channels (each channel therefore having a respective, selected value). For each channel, then, the number of possible paths in path length estimation is selected based on the metric calculator value selected for the respective channel (again, each channel having a respective, selected value). And for at least the foregoing reasons, Appellant respectfully submits that the objection to Claim 1 (and similarly Claims 15 and 21) is overcome.

B. Claims 1, 3, 4, 6, 9-17, 19-22 and 24 are Patentable

According to one claimed aspect of the present invention, as recited by independent Claim 1, an apparatus is provided that includes a selector and a decoder. As recited, the selector is configured to select metric calculator values for respective ones of a plurality of channels in a Multiple-Input, Multiple-Output (MIMO) communication system in which transmit data is communicated to a receiving station upon the plurality of channels and received as receive data thereat. In this regard, the metric calculator values selected for at least two of the channels differ from one another. As also recited, the decoder is configured to separately decode values of the receive data received upon separate ones of the channels. In this regard, for the values of the receive data received upon each of the channels, the decoder is configured to perform path length estimation for the respective channel, including being configured to calculate a path length for each of a number of possible paths upon which to estimate a minimum path length. The number of possible paths is selected based on the metric calculator value selected for the respective channel.

1. Selecting Metric Calculator Values

In contrast to independent Claim 1, neither Walton nor Hatakeyama (nor *Kim/Iltis*), taken individually or in any proper combination, teach or suggest selecting metric calculator values for respective ones of the channels in a MIMO system for a decoder to perform path length estimation for each of the channels, including calculating path lengths for a number of possible paths selected based on a respective metric calculator value. The Examiner alleges that Walton discloses performing path length estimation, asserting that Walton discloses a Viterbi decoder

that estimates an optimum path length. And to supposedly strengthen this position as to Viterbi decoding, the Examiner cites Hatakeyama for a particular Viterbi decoder configuration. Appellant respectfully disagrees, and separately addresses each reference as well as the combination below.

a) Walton

Briefly, Walton discloses a system and method for performing rate control for data transmission in which a suitable data rate for parallel channels is selected based on estimated channel conditions (signal-to-noise ratios – SNRs). However, Walton (as well as *Kim/Iltis*) does not teach or suggest the aforementioned feature of independent Claim 1. In the final Official Action, the Examiner appears to interpret selectable transmission modes of Walton as corresponding to the recited metric calculator values for MIMO channels; and alleges that these transmission modes are supplied to a Viterbi decoder. As further alleged, for each channel (eigenmode), the Viterbi decoder performs path length estimation for the respective channel, including calculating path lengths for a number of possible paths, the number of possible paths being selected based on the transmission mode for the respective channel. Appellant respectfully disagrees.

Walton does appear to disclose selectable transmission modes, but in contrast to the aforementioned interpretation, Walton does not supply its transmission modes to a Viterbi decoder for use by the Viterbi decoder in selecting the number of possible paths for which to calculate path lengths in performing path length estimation, similar to the decoder of independent Claim 1. Rather, according to Walton, its transmission modes (selectable for application to its channels) may indicate transmission parameters indicating a particular data rate, coding scheme or code rate, interleaving scheme, modulation scheme or the like. Walton, paragraph [0028]. As also disclosed, the coding scheme may include CRC coding, convolutional coding, turbo coding, block coding or the like. *Id.* at paragraph [0181]. And depending on the coding scheme according to which data for a channel is coded, the controller 970 (see FIG. 11) supplies decoding control to the decoder for the respective channel so that the decoder may decode the data in a complementary manner. *Id.* at paragraph [0191] ("The de-interleaved data ... is

decoded by an associated decoder 1136 in a manner complementary to that performed at access point 510x, as indicated by a decoding control provided by controller 970." – emphasis added). Thus, if the data is coded according to a turbo coding scheme, the decoding control may indicate to the decoder to implement a turbo decoder; and if the data is coded according to a convolutional coding scheme, the decoding control may indicate to the decoder to implement a Viterbi decoder. *Id.*

Even if one could consider the transmission modes of Walton to correspond to the recited selected metric calculator values, Walton still does not teach or suggest that its decoder performs path length estimation for each of the channels, including calculating path lengths for a number of possible paths selected based on a respective transmission mode, similar to the metric calculator value, similar to independent Claim 1. Instead, Walton at best discloses selecting a transmission mode that indicates a coding scheme for a channel according to a particular transmission mode, and supplying decoding control to a decoder for that channel so that the decoder may operate in a complementary manner.

In the Advisory Action, the Examiner states:

> ... *The number of possible paths of the Viterbi decoder is being selected based on signal quality such as SNR, which is reflected in transmission modes. In other words, depending on which transmission mode is selected, different modulation scheme with different code rate controls the number of possible path in Viterbi decoding. Therefore, Walton meets the claimed limitation.*

Advisory Action of Oct. 1, 2008, page 2. Appellant respectfully disagrees with this interpretation of Walton, and submits that nowhere does Walton teach or suggest selecting the number of possible paths of a Viterbi decoder based on any SNR (or any other indicator of signal quality) reflected in its transmission modes. Further, nowhere does Walton teach or suggest that the modulation schemes with different code rates have any bearing on the number of possible paths in Viterbi decoding. Again, other than its transmission mode possibly directing implementation of a Viterbi decoder (as opposed to another type of decoder), Walton teaches or suggests nothing as to the particular implementation of its Viterbi decoder, much less anything related to calculating path lengths for a selectable number of possible paths, similar to independent Claim 1.

b) Hatakeyama

Similar to Walton, Appellant respectfully submits that Hatakeyama also does not teach or suggest the aforementioned feature of independent Claim 1. That is, in contrast to independent Claim 1, Hatakeyama also does not teach or suggest a decoder performing path length estimation for each of a plurality of channels, including calculating path lengths for a number of possible paths selected based on a respective, selected metric calculator value. As cited for disclosing features of the claimed invention, Hatakeyama discloses a structure of a Viterbi decoder. As disclosed by Hatakeyama, its Viterbi decoder does calculate a branch metric value (e.g., Euclidian distance) between received data (symbol) and each branch (each possible symbol), and calculate a path metric value for each of a number of state transitions corresponding to the branch metrics, one of which is selected as the maximum likelihood state transition.

One may argue that the path metrics correspond to possible paths. Even in such an instance, however, nowhere does Hatakeyama teach or suggest that the number of path metrics (possible paths) is selected based on a metric calculator value selected for a particular channel, similar to selecting the number of paths of the path length estimation performed according to independent Claim 1. Rather, the number of path metrics is predetermined (2^{K-1}) according to the restriction length of the convolutional code encoder ($K = 9$, resulting in 256 path metric values). *See* Hatakeyama, col. 6, l. 66 – col. 7, l. 4; and col. 8, ll. 40-44.

Appellant respectfully submits that neither Walton nor Hatakeyama (nor *Kim/Iltis*) individually teach or suggest selecting metric calculator values for respective ones of the channels in a MIMO system for a decoder to perform path length estimation for each of the channels, including calculating path lengths for a number of possible paths selected based on a respective metric calculator value, as recited by independent Claim 1. And as neither teach or suggest the aforementioned feature of independent Claim 1, no combination of Walton and Hatakeyama (and *Kim/Iltis*) teaches or suggests the feature.

Appellant therefore respectfully submits that independent Claim 1, and by dependency Claims 3, 4, 6, 7 and 9-14, is patentably distinct from Walton and Hatakeyama, taken individually or in any proper combination. Appellant also respectfully submits that independent

Claims 15 and 21 recite subject matter similar to independent Claim 1, including selecting metric calculator values for channels in a MIMO system for a decoder to perform path length estimation for each of the channels, including calculating path lengths for a number of possible paths selected based on a respective metric calculator value. Accordingly, Appellant respectfully submit that independent Claims 51 and 21, and by dependency Claims 16, 17, 19, 20 and 22-24, are also patentably distinct from Walton and Hatakeyama, taken individually or in any proper combination, for at least the same reasons given above with respect to independent Claim 1.

2. The Official Action Fails to Demonstrate Prima Facie Obviousness

The Examiner alleges that one skilled in the art would have been motivated to combine Walton and Hatakeyama to "improve decoding accuracy in a communication system." Official Action of June 2, 2008, page 4; and Advisory Action of Oct. 1, 2008, page 2. Appellant respectfully submits, however, that such a broad conclusory statement alone is insufficient to demonstrate obviousness of the claimed invention.

Appellant acknowledges the Supreme Court's recent decision in which the Court rejected a rigid application of the "teaching, suggestion or motivation" (TSM) test. *KSR Int 'l. Co. v. Teleflex, Inc.*, 127 S.Ct. 1727, 82 USPQ2d (BNA) 1385 (2007). Nonetheless, in *KSR Int'l. Co.*, the Court did state that obviousness often requires determining whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue, and that to facilitate review, this analysis should be made explicit. *See KSR Int'l. Co.*, 127 S.Ct. at 1740–41, 82 USPQ2d (BNA) at 1396. Even further, the Court noted that "[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *Id.*, 127 S.Ct. at 1740-41, 82 USPQ2d (BNA) at 1396, *citing In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d (BNA) 1329 (Fed. Cir. 2006) (emphasis added).

As clearly explained by the Supreme Court in *KSR Int'l. Co.*, then, any finding of obviousness should be based on an apparent reason to combine the prior art, and must be supported by more than mere conclusory statements. In the instant case, the Examiner attempts to support the alleged modification of Walton per Hatakeyama by asserting an improvement in

decoding accuracy. But nowhere does the Examiner support the aforementioned conclusion with any reasoning or with some rationale underpinning the conclusion, whether in the nature of the problem to be solved, any of the cited references, or knowledge of those skilled in the art. And in line with the Court in *KSR Int'l. Co.*, the obviousness rejection of the present claims cannot be sustained by merely concluding that one skilled in the art would have found it obvious to modify Walton per Hatakeyama, without at least an explanation of how the alleged modification would have achieved the alleged improvement of decoding accuracy.

C. Claims 7 and 23 are Patentable

Claims 7 and 23 stand rejected as being unpatentable over Walton in view of Hatakeyama, and further in view of *Kim/Iltis*. Appellant respectfully submits, however, that *Kim/Iltis* does not cure the defects of Walton or Hatakeyama. That is, even considering *Kim/Iltis*, none of Walton, Hatakeyama or *Kim/Iltis*, taken individually or in any proper combination, teach or suggest selecting metric calculator values for channels in a MIMO system for a decoder to perform path length estimation for each of the channels, including calculating path lengths for a number of possible paths selected based on a respective metric calculator value, similar to the claimed invention. Accordingly, Appellant respectfully submit that the claimed invention is patentably distinct from Walton, Hatakeyama and *Kim/Iltis*, taken individually or in any proper combination.

8. ***Claims Appendix.***

The claims subject to this appeal are as follows:

1. (Previously Presented) An apparatus comprising:

a selector configured to select metric calculator values for respective ones of a plurality of channels in a Multiple-Input, Multiple-Output communication system in which transmit data is communicated to a receiving station upon the plurality of channels and received as receive data thereat, the metric calculator values selected for at least two of the channels differing from one another; and

a decoder configured to separately decode values of the receive data received upon separate ones of the channels,

wherein, for the values of the receive data received upon each of the channels, the decoder being configured to decode the values of the receive data includes being configured to perform a path length estimation for the respective channel, including being configured to calculate a path length for each of a number of possible paths upon which to estimate a minimum path length, the number of possible paths being selected based on the metric calculator value selected for the respective channel.

2. (Cancelled)

3. (Previously Presented) The apparatus of claim 1, wherein the decoder is configured to perform a separate path-length estimation for each of the channels.

4. (Previously Presented) The apparatus of claim 3, wherein the decoder is configured to calculate a path length for each of a number of possible paths defined by possible values of the transmit data.

5. (Cancelled)

6. (Previously Presented) The apparatus of claim 3, wherein the decoder being configured to perform a path length estimation includes being configured to estimate a maximum likelihood path.

7. (Previously Presented) The apparatus of claim 6, wherein the decoder being configured to estimate a maximum likelihood path includes being configured to estimate a maximum likelihood path using a QRD (QR Decomposition) technique upon the selected number of possible paths.

8. (Cancelled)

9. (Previously Presented) The apparatus of claim 1, wherein the selector is configured to select the metric calculator values based on communication conditions upon the respective channels.

10. (Previously Presented) The apparatus of claim 9, wherein the selector is configured to receive indications of the communication conditions upon the respective channels, the selector being configured to select the metric calculator values based on the indications.

11. (Previously Presented) The apparatus of claim 9, wherein the selected number of possible paths is inversely related to the communication conditions such that the number of possible paths increases when the communication conditions worsen.

12. (Previously Presented) The apparatus of claim 1, wherein the communication system operates pursuant to an OFDM (Orthogonal Frequency Division Multiplexing) scheme in which channels are defined upon channel subcarriers, and wherein the metric calculator values selected by the selector are representative of communication conditions upon respective channel subcarriers.

13. (Previously Presented) The apparatus of claim 12, wherein the metric calculator values are maintained at a storage table, and wherein the selector is configured to select metric calculator values from the values maintained at the storage table.

14. (Previously Presented) The apparatus of claim 12, wherein the selector is configured to dynamically select the metric calculator values.

15. (Previously Presented) A method comprising:

selecting metric calculator values for respective ones of a plurality of channels in a Multiple-Input, Multiple-Output communication system in which transmit data is communicated to a receiving station upon the plurality of channels and received as receive data thereat, the metric calculator values selected for at least two of the channels differing from one another; and

separately decoding values of the receive data received upon separate ones of the channels,

wherein, for the values of the receive data received upon each of the channels, decoding the values of the receive data includes performing a path length estimation for the respective channel, including calculating a path length for each of a number of possible paths upon which to estimate a minimum path length, the number of possible paths being selected based on the metric calculator value selected for the respective channel.

16. (Previously Presented) The method of claim 15, wherein selecting the metric calculator values comprises selecting the metric calculator values based on communication conditions upon the respective channels.

17. (Previously Presented) The method of claim 15 wherein performing a path length estimation comprises performing a maximum-likelihood path estimation, including calculating a path length for each of a number of possible paths defined by possible values of the transmit data.

18. (Cancelled)

19. (Previously Presented) The method of claim 15, wherein selecting the metric calculator values comprises selecting the metric calculator values based on communication conditions upon the respective channels.

20. (Previously Presented) The method of claim 15, wherein the communication system operates pursuant to an OFDM (Orthogonal Frequency Division Multiplexing) scheme in which channels are defined upon channel subcarriers, and wherein selecting the metric calculator values comprises selecting the metric calculator values representative of communication conditions upon respective channel subcarriers.

21. (Previously Presented) An apparatus comprising:

circuitry configured to select metric calculator values for respective ones of a plurality of channels in a Multiple-Input, Multiple-Output communication system in which transmit data is communicated to a receiving station upon the plurality of channels and received as receive data thereat, the metric calculator values selected for at least two of the channels differing from one another,

wherein the circuitry is also configured to separately decode values of the receive data received upon separate ones of the channels, and

wherein, for the values of the receive data received upon each of the channels, the circuitry being configured to decode the values of the receive data includes being configured to perform a path length estimation for the respective channel, including being configured to calculate a path length for each of a number of possible paths upon which to estimate a minimum path length, the number of possible paths being selected based on the metric calculator value selected for the respective channel.

22. (Previously Presented) The apparatus of claim 21, wherein the circuitry being configured to perform a path length estimation includes being configured to estimate a maximum likelihood path.

23. (Previously Presented) The apparatus of claim 22, wherein the circuitry being configured to estimate a maximum likelihood path includes being configured to estimate a maximum likelihood path using a QRD (QR Decomposition) technique upon the selected number of possible paths.

24. (Previously Presented) The apparatus of claim 21, wherein the circuitry is configured to select the metric calculator values based on communication conditions upon the respective channels.

9. ***Evidence Appendix.***

None.

10. ***Related Proceedings Appendix.***

None.

CONCLUSION

For at least the foregoing reasons, Appellant respectfully requests that the rejections be reversed.

Respectfully submitted,

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